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**OLIGOCENE FOSSILS FROM THE NEIGHBORHOOD OF CARTAGENA, COLOMBIA,
WITH NOTES ON SOME HAITIAN SPECIES.**

BY HENRY A. PILSBRY AND AMOS P. BROWN.

The material described below was collected by Mr. Lloyd B. Smith in 1914, in the course of professional work in the vicinity of Cartagena, chiefly near the so-called "mud volcanoes" and at Cenizas. Most or all of them seem to be from Upper Oligocene beds, about equivalent in age to the Gatun in the Canal Zone.

A few fossils collected by Mr. Smith in the following year in Haiti are also described. Their chief interest is in adding to the evidence of extensive Oligocene beds south of the main range of the island. The species made known up to this time are not sufficient to fix the position of these beds in the Oligocene series.¹

When not otherwise specified, the species mentioned are from near Cartagena.

Conus proteus Hwass.

A specimen showing fewer color-spots than the recent *C. proteus*.

Conus molis B. and P.

Conus imitator B. and P.

Conus æmulator B. and P.

Conus gaza P. and J.

These four species were described from the Gatun bed.

Turris cartagenensis n. sp. Pl. 5, fig. 1.

A species grouping with *T. henekeni* (Sowerby) of Santo Domingo, from which it differs by the greater number and smaller size of longitudinal folds—ten on the last whorl. Form, sculpture and structure of the anal fasciole are as in the Santo Domingan species. Length of the broken shell figured, 36.5 mm.

Drillia gatunensis Toula.

Cancellaria dariena Toula.

Mitra longa Gabb.

Marginella mediocris n. sp. Pl. 5, fig. 2.

A species related to *M. latissima* Dall, but differs from the narrowest specimens of that by its much narrower contour. The outline

¹ See also a brief paper by one of us in PROC. ACAD. NAT. SCI. PHILA., 1910, p. 487.

below the shoulder is but slightly convex. The spire is quite low, rising very little above the posterior level of the outer lip. The lip is not very broad, moderately thick, with a slight ledge behind; its inner edge bears about 16 small, unequal teeth. The four columellar folds are about equal, the lower ones being more oblique than in *M. latissima*, and not so strong.

Length 13.7, diameter 8.7 mm.

There is also a fragment of a much larger *Marginella*, not determinable.

Oliva sayana immortalis n. subsp. Pl. 5, fig. 6.

The shell differs from the recent *O. sayana* (*litterata*) by being smaller, less broad at the base, the sutural channel broader and deeper, and the ledge which encircles the shell above the siphonal fasciole is closer to the upper siphonal plait at the edge of the apertural callus. The outer lip is well thickened, indicating maturity.

Length 41, greatest diameter 18.4 mm.

Three other specimens are somewhat smaller, but show the same characters.

Strombina cartagenensis n. sp. Pl. 5, fig. 3.

The shell is fusiform with a rather long spire of $7\frac{1}{2}$ whorls; the earlier ones worn, the later having sculpture of rather narrow, very slightly curved longitudinal ribs, crossed by a group of about 7 inconspicuous spirals in the upper part, and strongly developed spiral cords about as wide as their intervals on the lower half of the last whorl, about 18 in number. The longitudinal ribs, of which there are 12 on the penultimate whorl, become shorter on the back of the last whorl, where they scarcely extend to the middle. There is a very thick and high varix behind the outer lip. The aperture is about three-fifths the length of the shell, narrow; outer lip heavily calloused, the callus bearing about 10 teeth. The columellar lip forms a thin, raised ledge.

Length 26.8, diameter 11.3 mm.; length of aperture 15.2 mm.

This species differs from the Panamic and Santo Domingan forms by its rounded periphery, without dorsal or ventral humps.

Strombina lloydsmithi n. sp. Pl. 5, fig. 4.

The shell is quite small, with the greatest width about at the anterior third of the length. Whorls 9, the first three convex, forming the smooth embryonic shell. The remaining whorls of the spire are flat, sculptured with straight longitudinal ribs about equal to their intervals, faint traces of two or three impressed spiral lines

visible in some of the intervals. The last whorl is convex, having ribs like those of the spire on the front, none on the back, but two precede the small, smooth lip-varix. The intercostal intervals are marked with deeply impressed spiral grooves, obsolete on the crests of the ribs on the front, and on the smooth dorsal patch, but passing over the ribs behind the lip. The outer lip has a heavy callus within, bearing about 9 teeth, the upper ones stronger. The columella bears a series of 8 teeth. The columellar edge is slightly raised, and there is a very heavy callus upon the body at the posterior commissure of the aperture.

Length 10.5, diam. 5.7 mm.; length of aperture 6 mm.

Solenosteira dalli Brown and Pilsbry.

Murex gatunensis Brown and Pilsbry.

Murex pomum Gmelin.

Typhis linguiferus Dall.

Typhis linguiferus Dall, Trans. Wagner Inst., III, pt. 1, p. 152, Pl. 12, fig. 7.

The single specimen agrees well with the description and figure of Dall's *Chipola* species, except that the spines on the varices are erect instead of curved.

Cassis monilifera Guppy.

Polinices mammillaris (Lam.).

Potamides avus n. sp. Pl. 5, fig. 5.

A species closely related to *P. pacificus* Sowerby, but differing by the different shape of the last whorl. The coronal tubercles are situated higher, directed somewhat upward, and there is no hump on the base in front of the aperture. The surface is strongly striate spirally. The inner lip has a distinct callous ridge near the posterior commissure of the aperture. There are about ten of the pointed tubercles on the last whorl.

This appears to be an ancestor of the recent species, which has more exaggerated sculpture.

Turritella cartagenensis n. sp. Pl. 5, fig. 13.

The whorls are nearly flat, but there is a slight concavity in the upper half and they are a little prominent below the suture; the periphery has a rounded prominence, visible above the suture. The light lines of growth are strongly retractive from the upper edge to below the middle of the visible surface of each whorl, then curving and becoming vertical or slightly protractive in the rest of their course. Spiral sculpture of unequal, unevenly spaced threads of various sizes, distinct but in low relief. There is a noticeable cingulus

formed by a couple of contiguous threads on a slight elevation, at the lower fourth of the whorls. The base is somewhat convex, and shows four very low, wide spiral welts, with the same finer spirals as the upper surface. The parietal callus is heavy. Length of the fragment figured 47 mm.; diameter, 24.5 mm.

Turritella lloydsmithi n. sp. Pl. 5, fig. 11.

This large species has some resemblance to *T. gatunensis*, the taper being about the same. The whorls are flat except at the periphery (or above the suture) where they bulge a little. This is most marked on the later whorls. The very faint growth-lines are slightly arcuate. Sculpture of about six low spiral cords unevenly spaced, those on the bulging lower part being coarser. The base shows about 7 strong spiral cords; over all there is a minute sculpture of unequal spiral threads. The suture is impressed and distinct. A specimen retaining five whorls measures 64.6 mm. long, 23.8 mm. in greatest diameter.

This species differs from *T. subgrundifera* and its allies by the sculpture, and from *T. gatunensis* by sculpture and the shape of the whorls, which are not excavated above.

Turritella subgrundifera Dall.

Turritella subgrundifera Dall, Trans. Wagner Inst., III, pt. 2, 1892, p. 313, Pl. 22, fig. 23.

We are unable to distinguish these specimens from *subgrundifera* from near Bailey's Ferry, Chipola River, of which we have compared a good series. Whether *T. atacta* Dall of the Tampa silex bed differs specifically seems somewhat doubtful, but the specimens known are smaller.

Turritella domingensis n. sp. Pl. 5, figs. 7, 7a, 9.

In the adult stage there are two approximate spiral cords, one at, the other above the periphery. Above this there are five spiral threads, the upper two close together, the others about equally spaced. The median part of the whorl is lightly concave, with very strongly arched growth-ridges at wide intervals. Over all there is a minute sculpture of slightly waved, irregular, sometimes anastomosing striæ, spiral and parallel on the lower part of the whorl, converging forward from each growth-ridge on the median part of the whorl. In the young shells, up to over 20 mm. in length, the ridge above the suture is acute and strong, the median concavity and the superior convexity are much more marked, and usually some of the median threads are beaded. The largest piece, of about 3 whorls, measures: length 37.3, diam. 18 mm.

Santo Domingo, W. M. Gabb. Type No. 2611, A. N. S. P.

This is *T. exoleta* Linn. of Gabb's Geology of Santo Domingo, p. 240.

Differs from *T. megalobasis* by having the early whorls more elaborately sculptured than the later, not smoother, as in *megalobasis*. It also tapers more gradually. Fig. 7a was inadvertently inverted.

With the preceding species in the Gabb collection there is one specimen probably referable to *T. megalobasis*, from which it differs only by having the same microscopic sculpture described for *T. domingensis*, and which is not visible on the small specimens of *megalobasis* at hand. It tapers much more rapidly than *T. domingensis*. Part of a whorl is shown magnified in Pl. 5, fig. 14 (the figure inverted).

***Turritella tornata* Guppy.**

Turritella tornata Guppy, Quarterly Journal of the Geological Society of London, vol. XXII, 1866, p. 580, Pl. 26, fig. 12 (Cumana, Venezuela, type loc.).

The Colombian specimens are all fragmentary, but have the typical shape and sculpture. The largest piece, of slightly over 3 whorls, measures 20 mm. in basal diameter, 41 mm. long.

This species was also taken by W. M. Gabb in Santo Domingo, the specimens smaller, and varying some in sculpture. An ancestral form of *T. perattenuata* was found with them in the Gabb collection.² *T. perattenuata* of the Pliocene is clearly distinct from *tornata* by its much slower taper, though all of the group are closely related. The sculptural development of the series reached its acme in the upper Oligocene when the most highly sculptured species, *T. altilira*, became extinct.

***Turritella calostemma* n. sp. Pl. 5, fig. 15.**

The shell resembles *T. altilira* Conrad. It is very long and tapers slowly; the whorls are rather narrow, and the suture is not obvious. The growth-lines are deeply arched across the visible part of the whorls. On each whorl there is a high, narrow spiral ridge at the upper fourth, its summit set with oblique tubercles. In the concave interval following there are numerous spiral striæ and a slightly

² *Turritella perattenuata præcellens* n. subsp., Pl. 5, fig. 12. Even more slender than *perattenuata*, the upper of the two prominent beaded cinguli being double, the lower more acute, and in the later stages both are higher. There are several small cords in the median concavity, three being more prominent than the others. The growth-lines are inconspicuous, and retract strongly in the upper half of the whorls. All of the specimens are broken.

Length 57.5, basal diam. 8 mm.; 18 whorls.

40 " " 13.7 " 5½ "

Cotypes No. 2608, A. N. S. P., collected by Wm. M. Gabb in Santo Domingo.

larger beaded central thread. Below the middle there is a second but narrower spiral ridge, slightly tuberculate, and near the lower edge there is a stronger spiral ridge, with convex, spirally striate, weakly tuberculate summit. The specimens are fragmentary, but indicate a length of at least 75 mm.; diameter of the largest fragment, 18 mm. It tapers a little more rapidly than *T. altilira*.

Haiti, 20 miles west of Azua. Also from between Las Cahobas and Thomonde; collected by Mr. Lloyd B. Smith, 1914.

This species differs from *T. altilira* by having three major spiral ridges, the lower two nearer together. In *altilira* and *tornata* there are but two, and the upper one is sometimes doubled more or less distinctly. In *T. calostemma* the upper ridge is simple.

T. calostemma and *T. altilira* seem to be two lateral branches of the *T. tornata* stock, highly accelerated in sculpture, reaching their acme and becoming extinct in the upper Oligocene, while descendants of the less specialized *tornata* stock held on to the Pliocene. Its last incarnation, *T. perattenuata*, shows little advance in sculpture beyond the Oligocene *tornata*; but it is specialized—probably overspecialized—by its extraordinary length and large number of whorls.

Petalococonchus domingensis Sowb.

Dentalium solidissimum n. sp. Pl. 5, fig. 8.

Known by a fragment which tapers rather slowly and is almost circular in section. The shell is very solid, at the lower breach the walls at least 3 mm. thick. It is sculptured with high ribs slightly narrower than their intervals, their crests and the intervals being rather strongly crenulated by circular striæ. The superficial layer has scaled off in great part, so that the finer sculpture described may perhaps be due to wear. There are 28 primary ribs, and near the larger end a few small interstitial riblets appear. Total length of the fragment, 28.2 mm.; greatest diameter 15.8 mm.; diameter 14 mm. at the smaller end.

This is probably a *Fissidentalium*, and from the fragment seems intermediate between *candidum* and *megathyris* in taper.

Dentalium cartagenense n. sp. Pl. 5, fig. 10.

A species of the group of *Dentalium disparile*. Moderately curved, having seven angles, the intervals concave at the smaller, flat at the larger end. The two intervals bounding the keel on the concave side are wider than the others, and the three forming the curve of the convex side are decidedly narrower than the rest. Intervals have a few longitudinal threads at the smaller end, increasing with

growth, so that at the larger end there are 27 cords in all. The growth-lines are inconspicuous. The shell is broken more or less at both ends.

Length 19.4 mm.; antero-posterior diameter at larger end 3.7; lateral diameter 3.9 mm.; lateral diameter at smaller end 2.4 mm.

Pitar (*Hysteroconcha*) *casta* n. sp. Pl. 6, fig. 4.

The shell is oblong with small, rather plump beaks. Sculpture of continuous, smooth concentric ridges, their edges overhanging the succeeding intervals a little, and some of them broadened into lamellæ at the anterior end. They are not enlarged or interrupted posteriorly, and there are no spines. Between the concentric ridges there are fine growth-lines, some of them larger, thread-like. Lunule defined by a groove, radially striate. Interior not seen. Length about 26 mm.; height 19 mm.; semidiameter 6 mm.

The sole specimen is partially imbedded in material too hard to be removed, so that the internal characters and posterior end could not be examined. The sculpture, however, is very perfectly preserved and characteristic, and leaves very little doubt that the shell is related to the recent *P. dione* (L.). The absence of spines would be expected in an early member of the group. The concentric lamellæ are developed less than in *P. dione*, and turn downwards at the edge. In contour *P. casta* stands nearer to *P. lupanaria*.

Yoldia *pisciformis* n. sp. Pl. 6, fig. 3.

The shell is much lengthened, the posterior part decidedly attenuated (end broken), anterior end rounded. Surface nearly smooth, but under a lens showing delicate, rather close grooves in harmony with growth-lines, from the middle downward. A pair of extremely low ribs run in a low curve from the beaks to the anterior-basal margin. The teeth are very numerous, and appear to be about equally so before and behind the beaks.

Length, as broken, 50 mm.; height 22.6 mm.; diameter 10.8 mm.

This is much broader than *Y. limatula* Say, with a situation in the basal margin and various other differences.

A small, very finely grooved *Leda* is represented by one broken specimen.

Arca consobrina Sowerby.

Glycymeris tumefactus n. sp. Pl. 6, fig. 7.

The shell is slightly inequilateral, very obese, with rather prominent beaks. Sculpture of many (about 55) extremely low radial ribs, somewhat wider than their intervals, and weak, coarse growth-lines.

The convexity of the ribs is, in fact, barely perceptible, though they are perfectly obvious to the eye. Where eroded quite superficially, the ribs are reduced to flat spaces between slightly raised radii of half their width, representing the intervals. With further erosion the ribs are transformed into slightly concave radii with the edges a little raised, and separated by very narrow, deeply bitten crevices occupying the middle of the original intercostal valleys. With further etching, the edges of the original ribs become more prominent, the middle being eaten out, so that the effect is an even radial striation. The basal margin is strongly toothed within. The cardinal area is moderately wide. Teeth not examined. Height 44.4, diam. 32 mm.; length about 42-mm.

This species resembles *G. gigantea* Reeve of the west coast, and also *G. jamaicensis* Dall, of the Bowden bed. It differs from both in wanting very minute radial striæ.

Glycymeris trilobicoستا n. sp. Pl. 6, fig. 5.

The shell is compressed, equilateral, with small beaks; rather thick. Sculpture of about 32 radial ribs, the small ones at the ends simple, the rest brace-shaped (—), their interstices narrow grooves; towards the beaks the cross-section becomes simpler, the ribs at first being convex. Over the ribs there is a very regular, close sculpture of minute concentric threads. The basal margin is toothed within, as usual. Cardinal area small, having about 3 V-shaped grooves. Teeth 12 on each side, rather long, smooth-sided, those of the median part a little bent angularly.

Height 14.6, length 14.5, semidiameter 4 mm.

The peculiar form of the ribs and the beautiful concentric sculpture over them are the chief characters of this species.

Glycymeris lloydsmithi n. sp. Pl. 6, fig. 6.

The shell is moderately convex, slightly inequilateral, the margins somewhat straightened on both sides of the umbo. Sculpture of about 27 very low, broad, rounded ribs, rapidly becoming weaker towards the base, faint on the anterior end, which is bisected by an indistinct radial angulation, as in *G. jamaicensis* and some recent Antillean species. No secondary radial striation can be seen. The cardinal area is very small, not grooved. There are 11 teeth before and 12 behind the beaks; most of the posterior teeth and a few of the anterior being angularly bent. The articulating faces of all of the teeth have very minute striation vertical to the tooth. The lower half of the inner margin of the shell shows about 20 prominences of the usual form.

Height 29.2, length 28, semidiameter 9 mm.

The ribs weaken rapidly towards the base, where they almost disappear, reminding one of *G. subovata* (Say). *G. jamaicensis* Dall differs by its greater length, much less arched hinge line and fine striation.

Ostrea vauhani insularis n. subsp. Pl. 6, figs. 1, 1a.

The common large oyster of Santo Domingo resembles *O. vauhani*, as described and figured by Dall, except in the following features: The beak is usually straight; the upper valve is very much smoother than the lower, marked with growth-lines only, and it is usually almost flat. The lower valve is thick, coarsely lamellar, not fluted, and has a rather deep beak cavity. The valves have a sparse denticulation inside near the hinge. Length of lower valve 106, width 58 mm. It may perhaps be well to signalize these differences by a subspecific name.

Santo Domingo, W. M. Gabb. No. 2635, A. N. S. P.

Ostrea cahobasensis n. sp. Pl. 6, fig. 8.

This oyster is similar to the preceding except that in a large series of specimens none were found to have the inner margins of the valves denticulate near the hinge. The upper valve is nearly flat and is perhaps somewhat rougher than in *insularis*. Length 85 mm. It often reaches a much larger size, length 190 mm. or more.

Haiti, in the mountains north of Lake Assuei, on the trail to Las Cahobas, W. W. Webster; Arrondissement de Las Cahobas, G. Roumain; also south of Thomonde, Lloyd B. Smith. Occurs in extensive beds composed almost wholly of oysters.

Type No. 1308, A. N. S. P.

Ostrea sculpturata osculum n. subsp. Pl. 6, figs. 2, 2a.

A small oyster of rounded or subtriangular shape, nearly equilateral. The umbonal half is more or less obviously cuneate in outline, with crenulated submargins; the opposite (basal) border is broadly rounded and extremely sinuous, typically having two deep, angular plications in each valve. The lower valve has a very shallow beak-cavity, the flatter upper valve none. The adductor impression is strongly lateral in position. Beaks are rather short and oblique, nearly equal in the two valves. Length 42.5, width 39, diam. 37 mm.

Some examples are flatter, with less emphatic and fewer plications. It is certainly not identical with the recent *O. megodon*. It differs from *O. sculpturata* by the reduced number and large size of the folds.

Type No. 3037, A. N. S. P.

EXPLANATION OF PLATES V AND VI.

PLATE V.—Fig. 1.—*Turris cartagenensis* n. sp.

Fig. 2.—*Marginella mediocris* n. sp.

Fig. 3.—*Strombina cartagenensis* n. sp.

Fig. 4.—*Strombina lloydsmithi* n. sp.

Fig. 5.—*Potamides avus* n. sp.

Fig. 6.—*Oliva sayana immortua* n. subsp.

Fig. 7.—*Turritella domingensis* n. sp.

Fig. 7a.—*Turritella domingensis*. Part of the last whorl, enlarged. The figure is inverted.

Fig. 8.—*Dentalium solidissimum* n. sp.

Fig. 9.—*Turritella domingensis*, n. sp. Young shell. $\times 3$.

Fig. 10.—*Dentalium cartagenense* n. sp.

Fig. 11.—*Turritella lloydsmithi* n. sp.

Fig. 12.—*Turritella perattenuata præcellens* n. subsp.

Fig. 13.—*Turritella cartagenensis* n. sp.

Fig. 14.—*Turritella megalobasis* Dall. Part of a whorl much enlarged. The figure is inverted.

Fig. 15.—*Turritella calostemma* n. sp.

PLATE VI.—Figs. 1, 1a.—*Ostrea vauhani insularis* n. subsp.

Figs. 2, 2a.—*Ostrea sculpturata osculum* n. subsp. Ventral and lateral views.

Fig. 3.—*Yoldia pisciformis* n. sp.

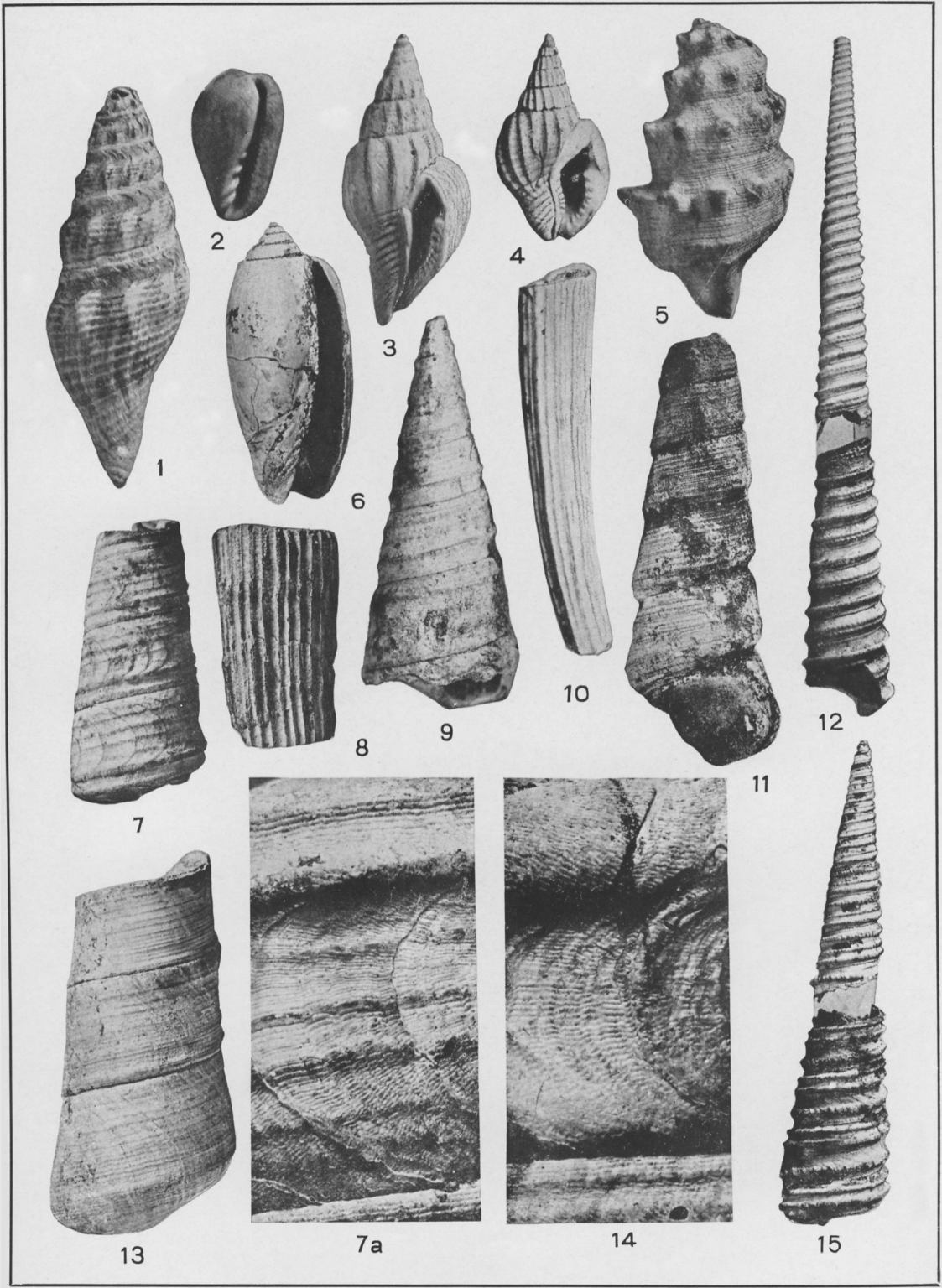
Fig. 4.—*Pitar casta* n. sp.

Fig. 5.—*Glycymeris trilobocosta* n. sp.

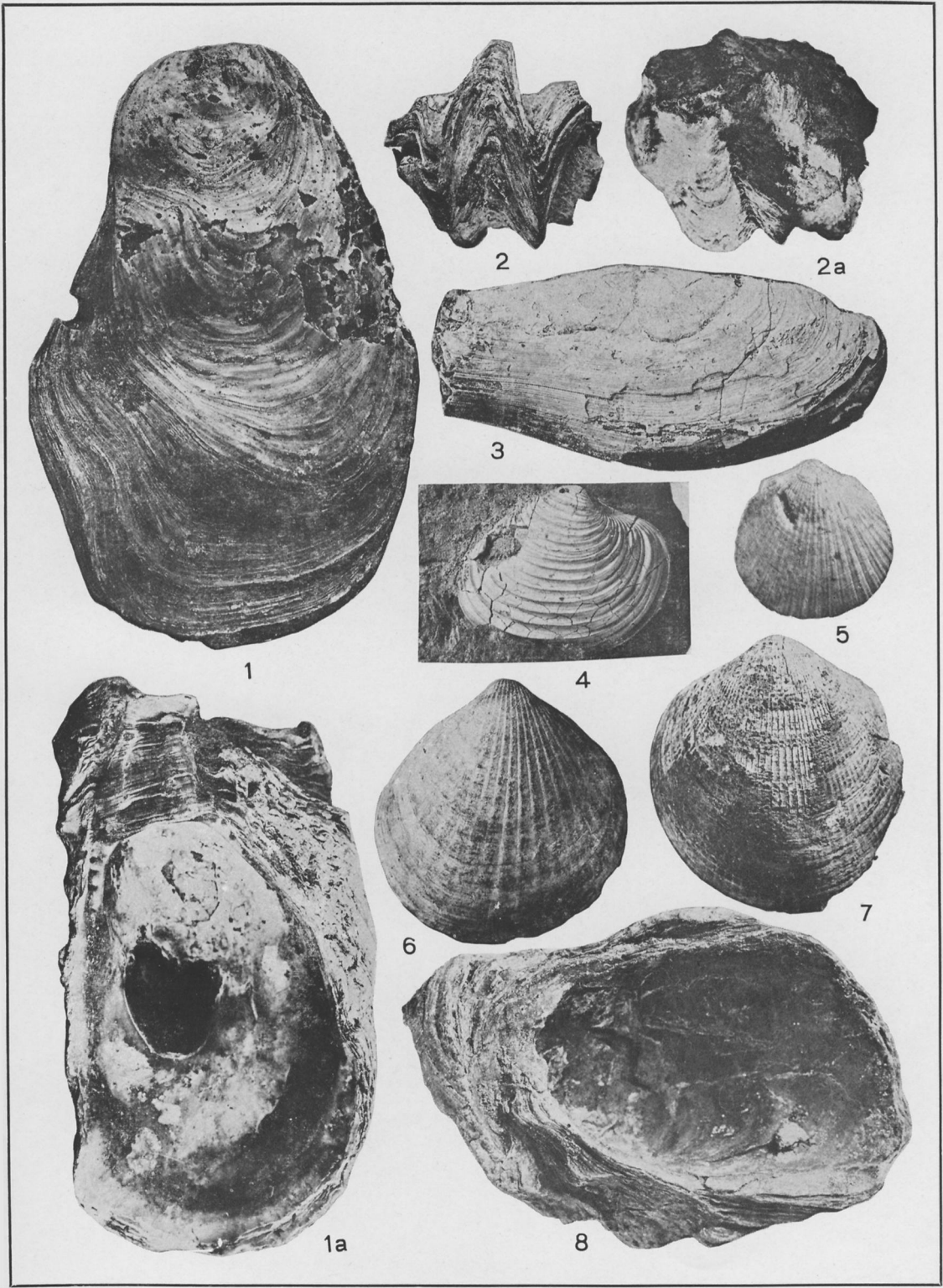
Fig. 6.—*Glycymeris lloydsmithi* n. sp.

Fig. 7.—*Glycymeris tumefactus* n. sp.

Fig. 8.—*Ostrea cahobasensis* n. sp. Interior of deep valve.



PILSBRY AND BROWN: OLIGOCENE FOSSILS.



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